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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

WILLE, DOUGLAS A

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 11/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Applicant(s)

09/319,699

Applicant(s)

LIPPERT ET AL.

Examiner

Douglas A Wille

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 23-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 23-25 and 29-43 is/are rejected.
- 7) ☒ Claim(s) 26-28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 22.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 23, 24 and 43 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 23 and 24 show a Si/SiGe/Si bipolar device where C is provided in any of the base, emitter or collector up to a concentration of  $10^{21}\text{cm}^{-3}$  and the lattice change is less than  $5(10)^{-3}$ . However, if C is added to Si with a concentration at the upper limit the lattice will change by more than the claimed amount and thus the claimed range is not enabled.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 25 and 29 – 34, 40, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzerotti et al. (IEEE) in view of Lanzerotti et al. (IEDM).

5. With respect to claims 25 and 29, Lanzerotti et al. (IEEE) show a bipolar transistor (see page 334 column 2) with a Si emitter, a SiGe base with C added at a concentration of 0.011 and a Si collector. C is added only to the base layer. Lanzerotti et al. (IEEE) show undoped spacers of

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SiGe on either side of the doped base layer to prevent diffusion of the dopant into the emitter or collector and thus the base is not in direct contact with the emitter and collector. Lanzerotti et al. (IEDM) shows that it is necessary to reduce the base resistance (page 249, column 1, first paragraph of the introduction) and that the addition of C reduces the diffusion of the B dopant. It would therefore be obvious to omit the undoped spacer layers to reduce the series resistance and then the base would be in direct contact with the emitter and the collector.

6. With respect to claims 30 and 31, Lanzerotti et al. (IEEE) show the Ge concentration as 0.25 (page 334, column 2, first full paragraph).
7. With respect to claim 32, Lanzerotti et al. (IEEE) show the base layer is 46 nm (page 334, column 2, first full paragraph).
8. With respect to claim 33, Lanzerotti et al. (IEEE) show the base layer as 46 nm but since criticality has not been established this is regarded as equivalent to 40 nm.
9. With respect to claim 34, Lanzerotti et al. (IEEE) show the product is 1250 which is within the claimed range.
10. With respect to claim 40, Lanzerotti et al. show the base is doped to  $7(10)^{19}$  (page 334, column 2, first full paragraph) which is within the claimed range.
11. With respect to claim 41, Lanzerotti et al. do not specify that the doping is uniform over the whole thickness but it would be obvious to make it uniform since a non-uniform profile would increase the resistance.
12. Claims 35 - 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzerotti et al. (IEEE) in view of Lanzerotti et al. (IEDM) and further in view of Sato et al.

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13. With respect to claims 35 and 36, Sato et al. show that a conventional base would be 59 nm wide with a 9% Ge level which gives the product as 531. Since it is standard, it would be obvious to use it in the Lanzertotti et al. (IEEE/IEDM) device as a design alternative.

14. With respect to claim 37, neither Lanzerotti et al. show the shape of the Ge distribution but Sato et al. show the distribution is essentially flat top (see Figure 4 and column 5, line 8). It would be obvious to use this shape since it is known to be functional.

15. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzerotti et al. (IEEE) in view of Lanzerotti et al. (IEDM) and further in view of Crabbe et al.

16. Neither Lanzerotti et al. show the shape of the Ge distribution but Crabbe et al. show the distribution is essentially triangular (see Figure 2 and column 4, line 5). It would be obvious to use this shape since it is known to be functional.

17. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzerotti et al. (IEEE) in view of Lanzerotti et al. (IEDM) and further in view of Sato et al. and Crabbe et al.

18. Neither Lanzerotti et al. show the shape of the Ge distribution but Sato et al. show the distribution is essentially flat top and Crabbe et al. show the distribution is essentially triangular. Since both distributions are known to be functional, it is obvious that a trapezoidal which is a combination of the two would be functional and it would have been obvious to use a trapezoidal distribution.

19. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzerotti et al. (IEEE) in view of Lanzerotti et al. (IEDM) and further in view of Li et al.

20. Neither Lanzerotti et al. show detailed contact structures but Li et al. show the use of a T-shaped emitter contact of doped poly (column 5, line 10) which permits a narrow emitter contact

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while providing a large contact area (column 3, line 54). It would have been obvious to use the T-shaped contact to provide large contact area as shown by Li et al. to provide ease of contacting.

*Allowable Subject Matter*

21. Claims 26 – 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. With respect to claims 26 – 28, prior art shows the use of C in SiGe layers to reduce strain but does not show the incorporation of C in the surrounding structures.

*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas A Wille whose telephone number is (703) 308-4949. The examiner can normally be reached on M-F (6:15-3:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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A handwritten signature in black ink, appearing to read "Douglas A. Wille". The signature is fluid and cursive, with the first name "Douglas" being more prominent.

Douglas A. Wille  
Patent Examiner

November 19, 2002